Are we driving 80 mph down the freeway … looking 20 feet ahead?

In the Anthropocene, we do not get to choose slower change.

How should Delta science be done under more rapid environmental change with more frequent surprises?

Presentation to Delta Plan Interagency Implementation Committee
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Delta Independent Science Board

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Environmental scientists study a nature that is “out there”. Change is observed over time, but it is thought of as a “disturbance” – invasive species, new pollutants – or a deviation – droughts or floods – to what “naturally” occurs.

This might be thought of as analogous to driving 10 mph, looking 20 feet ahead. Safe Enough.

We are now in the Anthropocene, nature is no longer “out there” but is changing due to historic emissions of greenhouse gases and other processes. We are already observing more rapid environmental change. … also more uncertainty.

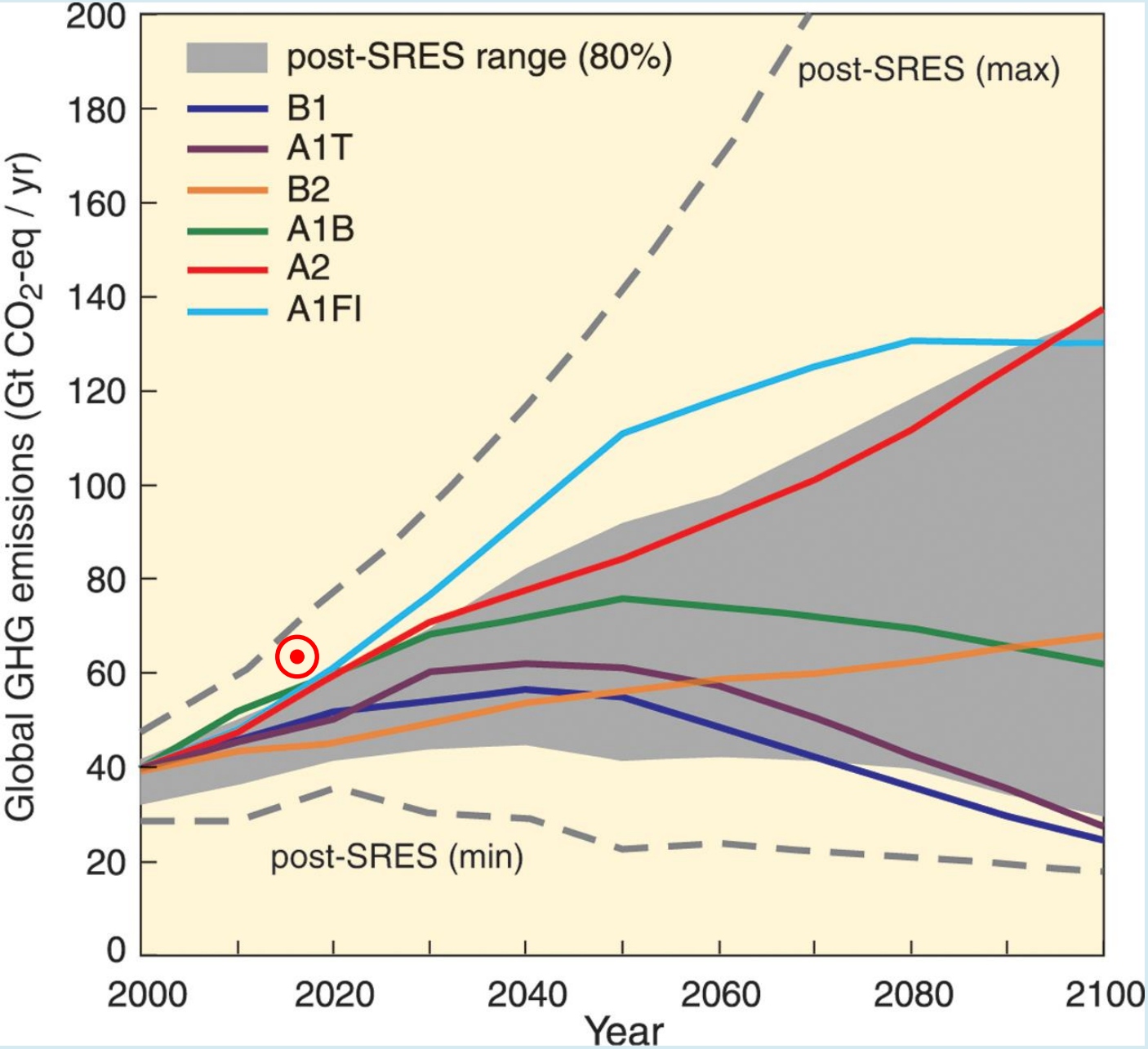
- Between 1870 and 1920, the Delta changed very quickly from a very large marsh with rivers dynamically meandering through it to a system of islands protected by levees and with dredged channels.
- Scientific understanding of how the Delta worked in 1870 is somewhat useful today for restoration efforts on the fringes of the Delta, but it is of little use for managing how most of the Delta works today. The knowledge we use today has accumulated, and some of it decayed, since the 1950s.
- We are at the start of another period of very rapid change with surprises and this will continue over at least the next 200 years.
- How should we do science today to provide, in time for it to be useful, meaningful policy and management information?
- How fast is the science we are doing today becoming obsolete
- The Delta ISB thinks these questions deserve very serious consideration. California's people, water system, and biosphere are too important to be driving 80 mph looking 20 feet ahead.

The members of the Delta ISB do not have experience with rapid environmental change. No scientists do, but some scientists have given it more serious thought.

We know other regions (i.e. the Great Lakes) have begun to look at climate scenarios and management alternatives

We have found one scientific article, for example, on doing ecology in the Anthropocene, but it is premised on the idea that climate science was becoming more predictive. This premise, however, does not stand up to how climate science has developed over the decades.

Consider what climate scientists thought were the most plausible climate scenarios in 2000.



About 20 years Ago, the IPCC used these emission scenarios.

Note that the gray shaded area was thought most likely, and thus became the "central narrative of IPPC's Fourth Assessment

In addition to emissions staying above the upper scenarios:

Geosphere Feedback ~~Uncertainties~~/Unknowns in 2000

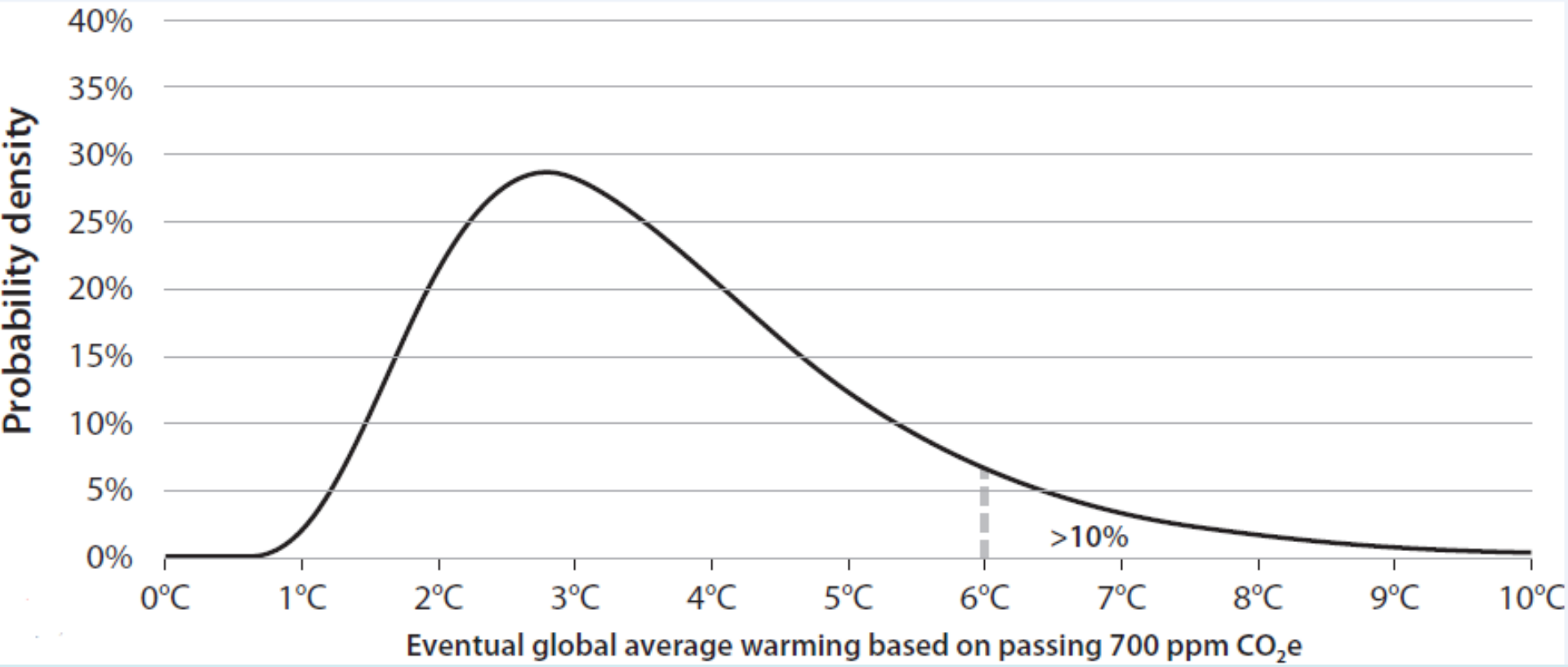
- Polar ice melted more rapidly, affecting sea level rise and Earth's albedo
- Ocean has absorbed more heat than expected, reducing terrestrial warming at least temporarily (good / bad, may / may not continue).

Biosphere Feedback ~~Uncertainties~~/Unknowns in 2000

- Forest fires greater/sooner than predicted, releasing more CO2
- Arctic tundra melting and releasing more CO2 and Methane

The fifth IPCC Assessment (2013) tried to put much more emphasis on uncertainties/unknowns as the "central" narrative.

Martin Weitzman's Analysis that climate risk has a Fat Tail



With greater unknowns, this period of more rapid change and uncertainty is not an ideal time to be “optimizing” the water / ecological system at its limits.

Forward Looking “Risk management” is a better framework.

In Delta Science Planning, might we assess future ecological thresholds and how soon they might be crossed under different warming/precipitation /sea level / biodiversity loss / non-native introduction paths?